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Compensatory Increase in Heart Rate Is Responsible for Exercise Tolerance among Male Patients with Permanent Atrial Fibrillation

It is widely accepted that exercise tolerance in patients with atrial fibrillation (AF) is reduced because development of AF is accompanied by loss of atrial kick, resulting in decreased CO (Ostermaier et al. 1997). However, many patients with permanent AF, which lasts for at least a year without interruption, and preserved left ventricular ejection fraction (LVEF ≥ 50%) are asymptomatic and have good exercise tolerance (Flaker et al. 2005; Myrstad et al. 2016). In such cases, the possible mechanism that compensates for the decrease in cardiac output accompanying the loss of atrial kick is a sufficient increase in heart rate (HR) during exercise. We investigated the relationship between exercise tolerance and peak HR during exercise using cardiopulmonary exercise testing in 242 male patients with preserved LVEF, 214 with sinus rhythm (SR) and 28 with permanent AF. Peak HR was significantly higher in the AF group than the SR group (148.9 ± 41.9 vs. 132.0 ± 22.0 beats/min, p = 0.001). However, oxygen uptake at peak exercise did not differ between the AF and SR groups (19.4 ± 5.7 vs. 21.6 ± 6.0 mL/kg/min, p = 0.17). In multiple regression analysis, peak HR (β , 0.091; p < 0.001) and the interaction term constructed by peak HR and presence of permanent AF (β , 0.05; p = 0.04) were selected as determinants for peak VO_2; however, presence of permanent AF was not selected (β , − 0.38; p = 0.31). Therefore, the impact of peak HR on exercise tolerance differed between the AF and SR groups, suggesting that a sufficient increase in HR during exercise is an important factor to preserve exercise tolerance among patients with AF.